Industrial and Systems Engineering
Undergraduate Data Analytics & Optimization Track

With the big data analytics trend, skills that encompass both data management and business analysis are in great demand. Big Data Analytics and Optimization focuses on using large data sets, computer models, and optimization methods to support data-driven decision-making. This powerful combination of big data analytics with optimization has been successfully demonstrated and will be increasingly needed in the management of:

- healthcare and transportation networks
- retail and financial decision making
- supply chain and logistics systems
- large scale information systems
- manufacturing operations
- energy and smart grids
- social networks.

The ISE Data Analytics and Optimization track is an undergraduate elective track designed with a comprehensive and applied curriculum providing students with a strong background in data science, computer science and optimization methods. The track requires a sequence of courses in:

- computer science
- operations research
- cognitive engineering
- probability and statistics.

Students will be prepared in the use of critical tool sets necessary for managing, visualizing, and extracting useful information from big data, as well as powerful skill sets such for modeling, simulation, optimization and decision analysis in order to support efficient data-driven decision making.

Entry into this track is competitive, as there is only space for a limited number of students in the required courses. Students will be admitted based on their EPHR, performance in CSE 1222/1223 and their math, programming and statistics courses. They should apply once all upper level math courses (Linear Algebra & Differential Equations) and statistics (Statistics 3470) have been completed.
Full completion of the Data Analytics Track requires the following ISE & Non-ISE coursework:

As part of the Core Courses required of all ISE undergraduates, students must complete the following courses relevant to this track (as well as all other ISE Core Courses):

- CSE 1222 (Programming in C++) or CSE 1223 (Introduction to Computer Programming in Java)
- CSE 2112 (Modeling & Problem Solving with Spreadsheets & Databases)
- MECHENG 2850 (Numerical Methods Using MATLAB)
- STAT 3470 (Probability & Statistics)
- ISE 3200 (Linear & Integer Programming) (this course can be taken concurrently with CSE 2221)
- ISE 3210 (Non-Linear & Dynamic Optimization)
- ISE 3700 (Cognitive Systems Engineering)
- ISE 4120 (Quality & Reliability Engineering)
- ISE 4100 (Stochastic Modeling & Simulation)

These courses must be completed before beginning the first required CSE course within the Data Analytics Track. The full list of all 5 required Data Analytics courses are listed below.

Specific Data Analytics Track Coursework:

In addition to the ISE & Non-ISE courses above, students must also complete the following:
- CSE 2221 (Software I) (4) (prereq of CSE 1222 or 1223) (offered AU & SP)
- CSE 2231 (Software II) (4) (prereq of CSE 2221) (offered AU & SP)
- CSE 2321 (Foundations I) (3) (prereq of CSE 2221 and Math 1151) (offered AU & SP)
- CSE 3241 (Database systems) (3) (prereq of CSE 2231 & CSE 2321) (offered AU & SP)
- CSE 5243 (Data mining) (3) (prereq of CSE 2331 & CSE 3241)
  (offered every AU & SP’16 (this is only guaranteed for spring ’16 for now)
*Can be taken concurrently with CSE 3241

To ensure additional background in ISE, students completing the analytics track must take 3 credits of an ISE course from the either the Manufacturing Track, Management Systems & Operations Research Track or the Human Factors Track. All three of these tracks are listed within this packet.

It’s important to note, students taking this track will complete 129 credit hours to graduate, as this track requires students to take a total of 20 hours of technical electives (5 CSE courses totaling 17 hours, plus one 3-credit hour ISE course).